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EXAMINER	
WILSON, JACQUELINE B	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/596,757	Applicant(s) WANG ET AL.	
	Examiner Jacqueline Wilson	Art Unit 2612	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 June 2000*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) *1-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☐ Claim(s) *1-28, 31-32* is/are rejected.

7)☐ Claim(s) *29 and 30* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 9.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 18 is objected to because of the following informalities: There is lack of antecedent basis for the claimed limitation "said floating diffusion". Appropriate correction is required. The examiner will interpret the limitation to refer to the associated portion.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 222(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-7, 9-11,18-19 are rejected under 35 U.S.C. 102(e) as being anticipated by Guidash (US 6,710,804).

Regarding Claim 1, Guidash teaches an image sensor comprising a plurality of image sensing pixel portions (col. 3, lines 64+), a plurality of image processing portions (referred to as per column signal processing, fig. 1a and 5), each of the image sensing pixel portion includes a photoreceptor (22), which has a first sensitivity to light (the photoreceptor has a first color filter which produces

a bandwidth different from the other output from the second color filter) and produces charge based on an amount of incident light, and an associated portion for the photoreceptor (referred to as floating diffusion 28), which associated portion selectively receives charge from the photoreceptor but which by itself has a second sensitivity to light different than the first sensitivity to light (the associated portion has a second color filter which produces a bandwidth different from the other output from the first color filter) and produces charge based on an amount of incident light (col. 2, lines 19+ and lines 53-65), an in-pixel follower transistor (fig 5 shows unlabeled follower transistor between elements 28 and 7), and an in-pixel select transistor (7), and wherein each of the image processing portions includes circuitry that produces an output indicative of both an amount of charge received by the associated portion, and an amount of charge received by the photoreceptor (fig. 5 also shows the per column signal processing portions in expanded view).

Regarding Claim 2, Guidash teaches the photoreceptor is a photogate (although Guidash teaches the photodetector is a photodiode, col. 7, lines 15 indicates that the photodetector could be a photogate), and the associated portion is a floating diffusion associated with the photogate in each said pixel (col. 4, lines 14+).

Regarding Claim 3, Guidash teaches a transfer gate (6), located between the photogate and the floating diffusion (see figs. 1a and 5), which separates charge stored in the photogate from the floating diffusion.

Regarding Claim 4, Guidash teaches a reset transistor (reset gate 17 and reset drain 19) connected between a reset level and the floating diffusion (see fig. 5), and which operates to reset a value of the floating diffusion to a specified level (col. 4, lines 20+).

Regarding Claim 5, Guidash teaches wherein each of the photogate, floating diffusion, and the in-pixel transistors are formed of MOS-type technology (referred to as CMOS active pixel image sensor; X-Y addressable sensor).

Regarding Claim 6, Guidash teaches the image processing portion includes a plurality of sample and hold circuits (col. 4, lines 39+).

Regarding Claim 7, Guidash teaches the plurality of sample and hold circuits include a first sample and hold circuit storing a reset level, a second sample and hold circuit storing a photogate level, and a third sample and hold circuit storing a floating diffusion level (col. 4, lines 39+; see also Parts List in col. 7).

Regarding Claim 9, Guidash teaches a controlling circuit (inherently discussed as providing an integration time), operating to control times of integration of the photogate and the floating diffusion (col. 4, lines 14+), such that the floating diffusion integrates for a same time or less time than an integration time of the photogate (fig. 2 teaches the integration time for the floating diffusion is less than an integration time of the photogate), and such that at least part of the time of integration of the floating diffusion overlaps a time of integration of the photogate (col. 3, lines 47+; see also fig. 2).

Regarding Claim 10, Guidash teaches a plurality of image processing circuits (figs. 1a and 5 shows one pixel arrangement), each of which are substantially identical, each image processing circuit associated with an entire column of pixels (referred to as per column signal processing).

Regarding Claim 11, Guidash teaches a control circuit which produces a row select signal (col. 3, lines 66-col. 4, line 13) to each of a plurality of pixels in a single row, to provide outputs from the each of the plurality of pixels to an individual image processing circuit (see fig. 1a and 5).

Regarding Claim 18, Guidash teaches a single continuous substrate of semiconductor material (col. 1, lines 5+; see also fig. 5), an image sensor portion (col. 2, lines 48; referred to a active pixel sensor) formed on the substrate (shown as one pixel; fig. 1a and 5), the image sensor portion including an array of image sensor pixels (10; col. 3, lines 62-67), including photoreceptors (22), each pixel formed of a MOS electronic component, an image processing portion also formed on the substrate (referred to as per column signal processing) and connected to the image sensor portion such that each pixel can be selectively coupled to a specified portion of the image processing portion (col. 3, lines 61-col. 4, line 5), the image processing portion including a plurality of transistors, each of which are formed of MOS transistors and a plurality of which of formed of CMOS transistors (see fig. 5), and a control portion (inherently discussed as providing an integration time), controlling integration of photoreceptors in the image sensor portion including times of the integrations (col. 4, lines 14+), and

also controlling connections between the image sensor and the image processing portion (col. 4, lines 35+) and controlling timing of operations in the image processing portions (see figs. 2 and 4), each of the pixels including a photoreceptor (22), a transfer gate (16), an associated portion (28) that selectively receives charge from the photoreceptor via the transfer gate, a reset transistor (reset gate 17 and reset drain 19), a follower transistor (fig 5 shows unlabeled follower transistor between elements 28 and 7), coupled to the associated portion, and operating to buffer the value of the associated portion, and a selection transistor (7), coupled to the control portion (inherent since the device is controlled using a timing device), the control portion controlling the selection transistor to produce an output from the specified pixel such that a level of the associated portion is first sensed and then values are coupled from the photoreceptor into the associated portion and to sample values on the associated portion (col. 4, lines 14-45), the values provided to the image processing portion (col. 4, lines 45+).

Claim 19 is analyzed and discussed with respect to Claims 6 and 7. (See rejection of Claims 6 and 7 above.)

Claim 31 is analyzed and discussed with respect to Claim 1. (See rejection of Claim 1 above.)

Claim 32 is analyzed and discussed with respect to Claim 7. (See rejection of Claim 7 above.)

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 8, 12-17, 20-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Guidash (US 6,710,804).

Regarding Claim 8, Guidash teaches outputting a first sensitivity output indicative of a difference between the floating diffusion level and the reset level and a second, high sensitivity output indicative of a difference between the photogate level and the reset level (via differential amplifiers 31 and 32; col. 4, lines 8+). Although Guidash does not specifically disclose low and high sensitivities, col. 2, lines 53+ indicates that a first and second bandwidth of light are sensed and that they may be of different levels or the same depending upon design choices. It is well known in the art for color filters to have high and low bandwidth in which the output is sensitive to different frequency of bandwidth to light. Therefore, the examiner believes that depending on the manufacturer at the time the invention was made, it would have been an obvious matter of design choice to use low and high sensitivities for the purpose of having an image sensor with extended dynamic range and sensitivity.

Regarding Claim 12, Guidash teaches imaging a scene by simultaneously obtaining a first and second sensitivity to light in each of a plurality of pixels of an

image sensing device and outputting both sensitivity signals, as discussed in Claim 1. However, Guidash does not specifically disclose low and high sensitivities using an integration period that is at least 80% overlapping for both high and low sensitivity. However, col. 2, lines 53+ indicates that a first and second bandwidth of light are sensed and that they may be of different levels or the same depending upon design choices. Figures 2 and 4 show a ratio of integration overlapping but do not specify the exact percentage. Therefore, the examiner believes that depending on the manufacturer at the time the invention was made, it would have been an obvious matter of design choice to use low and high sensitivities using an integration period that is at least 80% overlapping for both high and low sensitivity for the purpose of having an image sensor with extended dynamic range and sensitivity.

Regarding Claim 13, Guidash teaches both a photosensor (22) and an associated device (28) that is associated with the photosensor which normally obtains charge from the photosensor, the photosensor obtaining the high sensitivity signal and associated device obtaining the low sensitivity signal (one having ordinary skill would recognize this fact since the color filters generate different bandwidth levels).

Claim 14 is analyzed and discussed with respect to Claim 2. (See rejection of Claim 2 above.)

Regarding Claim 15, Guidash teaches obtaining a signal by determining a reset level of the floating diffusion (col.4, lines 20+), determining an integrated

value indicating the level of the floating diffusion obtained by integrating a scene for a first specified time (t_{intfd}), obtaining a second integrated level obtained by integrating the scene in the photogate for a second specified time (t_{intpd}), and outputting differences between the reset, photogate, and floating diffusion levels (via differential amplifiers 31 and 32; col. 4, lines 8+).

Claim 16 is analyzed and discussed with respect to Claim 9. (See rejection of Claim 9 above.)

Regarding Claim 17, Guidash teaches the obtaining and determining comprises sampling the floating diffusion level, sampling the reset level, and then transferring a photogate level to the floating diffusion level and sampling the floating diffusion level again to obtain a photogate level (col. 4, lines 42+). Although Guidash does not teach the specified order, it would have been obvious to change the order since it does not produce a different result. The fact of producing difference signals between the reset level and the floating diffusion level, and the reset level and the photogate is the result. Therefore, it would have been obvious to produce the sampling of the reset level, floating diffusion level, and the photogate level in an order as desired by the manufacturer to produce difference output signals.

Claim 20 is analyzed and discussed with respect to Claim 8. (See rejection of Claim 8 above.)

Claim 21 is analyzed and discussed with respect to Claim 2. (See rejection of Claim 2 above.)

Regarding Claim 22, Guidash teaches a plurality of sample hold circuits, a first sample and hold circuit sampling a reset level (col. 4, lines 45-48), a floating diffusion sample and hold circuit sampling a level in the floating diffusion prior to transfer of photogate charge thereto (col. 4, lines 41-45), and a photogate sample and hold circuit sampling a level on the floating diffusion after transfer of photogate charge thereto (col. 4, lines 48-51).

Regarding Claim 23, Guidash inherently teaches the sample and hold circuits are controlled by the control portion as shown in the timing diagram of figure 2.

Regarding Claim 24, Guidash teaches the image processing portion includes a plurality of image processing circuits (see fig. 5) arranged such that one image processing circuit is associated with an entire column of the image sensor pixels and the control circuit controls the image sensor pixels to select an entire row of image sensor pixels at one time, the entire selected row being coupled simultaneously to different ones of the image processing circuits to determine values therefrom to thereby operate to output an entire column in parallel (col. 3, lines 62-col. 4, line 4).

Regarding Claim 25, Guidash teaches a reset transistor in each of the pixels (fig. 5, reset gate 17 and reset drain 19).

Regarding Claim 26, Guidash teaches the control portion controls integration times of both the photogate and the floating diffusion by controlling the reset transistor to the floating diffusion to first reset the floating diffusion, then

control the select transistor to sample the level on the floating diffusion (col. 4, lines 37-45).

Regarding Claim 27, Guidash teaches allowing integration to occur in a floating diffusion associated with a photogate (col. 4, lines 35+), first sampling a level of integration which has occurred in the floating diffusion and then transferring charge from the photogate to the floating diffusion and sampling the level that has occurred in the photogate (col. 4, lines 47+), and outputting two values indicative respective of a different sensitivity signals that were integrated at substantially the same time based on the floating diffusion signal and the photogate signal (see fig. 5). Although Guidash does not specifically disclose low and high sensitivities, col. 2, lines 53+ indicates that a first and second bandwidth of light are sensed and that they may be of different levels or the same depending upon design choices. It is well known in the art for color filters to have high and low bandwidth in which the output is sensitive to different frequency of bandwidth to light. Therefore, the examiner believes that depending on the manufacturer at the time the invention was made, it would have been an obvious matter of design choice to use low and high sensitivities for the purpose of having an image sensor with extended dynamic range and sensitivity.

Regarding Claim 28, Guidash teaches both a photosensor (22) and a floating diffusion signal (28) that is associated with the photosensor which normally obtains charge from the photosensor, the photosensor obtaining the high sensitivity signal and associated device obtaining the low sensitivity signal

(one having ordinary skill would recognize this fact since the color filters generate different bandwidth levels). Guidash further teaches that the floating diffusion signal is subtracted from the reset signal (via differential amplifier 31).

Allowable Subject Matter

5. Claims 29 and 30 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Regarding Claim 29, the prior art neither teaches nor fairly suggests allowing integration to occur in a floating diffusion associated with a photogate, first sampling an integration level of the floating diffusion and transferring charge from the photogate to the floating diffusion and sampling the level occurred in the photogate, and outputting a low and high sensitivity signal that were integrated at substantially the same time based on the floating diffusion signal and the photogate signal, as claimed in claim 27, **wherein the high sensitivity signal corresponds to the photogate signal subtracted from the floating diffusion signal.**

Regarding Claim 30, the prior art neither teaches nor fairly suggests allowing integration to occur in a floating diffusion associated with a photogate, first sampling an integration level of the floating diffusion and transferring charge from the photogate to the floating diffusion and sampling the level occurred in the photogate, and outputting a low and high sensitivity signal that were integrated at substantially the same time based on the floating diffusion signal and the

photogate signal, as claimed in claim 27, wherein the floating diffusion is 30-40 times less sensitive to light than the photogate.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jacqueline Wilson whose telephone number is (703) 308-5080. The examiner can normally be reached on 8:30am-5:00pm (alternate Fridays off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wendy Garber can be reached on (703) 305-4929. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JBW
06/08/04

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